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**LLOYD C. MEISSNER, P.E.
SENIOR CONSULTANT**

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Mr. Meissner is a registered professional metallurgical engineer with 41 years of experience in the field of metallurgical engineering and materials science with a focus on failure analysis. He has nearly three decades of experience with aerospace and defense industry projects, most recently concentrating on forensics. His consulting projects include analysis of HVAC systems, corrosion of potable water and sprinkler piping, a variety of water losses, home appliance failures, medical device analysis and consulting on a wide variety of materials issues related to insurance subrogation and litigation.

Mr. Meissner's laboratory experience includes X-ray Computed Tomography (CT) Scanning, Scanning Electron Microscopy X-ray Energy Dispersive Spectroscopy (SEM/EDS), Fourier Transform Infrared (FT-IR) spectroscopy and metallography. In addition, he is a 43-year member of ASM International and holds a U.S. patent on the design of an electrode connector for ring laser gyros.

Whether consulting with industrial clients to evaluate manufacturing or processing defects or working with insurance professionals or attorneys to help resolve legal matters, a thorough and concise analysis is always the result.

Areas of Specialization

- Corrosion
- Electron Microscopy
- Failure Analysis and Fractography
- Materials Joining and Plating
- Medical Device Contamination
- X-ray CT Scanning

Education

Bachelor of Science, Michigan Technological University, Houghton, MI 1983

Licenses/Certifications

State of Minnesota..... P.E. License 19668

Professional Affiliations/Honors

ASM International

Minnesota Microscopy Society

Patent, Electrode Connector for Ring Laser Gyros US 7,429,198B1, September 30, 2008

Positions Held

Engineering Systems Inc., Plymouth, Minnesota

Senior Consultant, 2019 – Present

Crane Engineering, Plymouth, Minnesota

Metallurgical/Materials Engineer, 2011-2018

Honeywell Aerospace Electronic Systems, Minneapolis, MN

Applications Engineer/Lead Metallurgical Engineer, 1990-2011

Honeywell Defense System Division Precision Weapons Operations, Minnetonka, MN

Metallurgical Engineer, 1985-1990

Honeywell Underseas Systems Division/Defense System Division, Hopkins, MN

Metallurgical Engineer, 1983-1985

Michigan Technologist University, Houghton, MI

Research Assistant, 1982

Presentations

“Investigation of Root Cause of Failure of TPU Gaskets used in Hydraulic Fluid Systems”, **Gaurav Nagalia, Lloyd Meissner, Jason Babcock**, International Materials Applications and Technologies Conference and Exposition, IMAT 2023, Detroit, MI, October 2023.

“How Processing Affects Performance of Metallic Materials,” **Lloyd C. Meissner**, presented at ESI Industrial Smart Sessions, ESI Plymouth, MN, October 2022

“Butane Stove and Cannister Failure Analysis,” **Lloyd C. Meissner**, International Materials Applications and Technologies Conference and Exposition, IMAT 2022, New Orleans, LA, September 2022.

“Butane Stove and Cannister Failure Analysis and Investigation,” **Lloyd C. Meissner/ Scott A. Sollars**, ESI hosted Webinar, ESI Plymouth, MN, March 2021.

“Metallurgical Evaluations of Pipe,” **Lloyd C. Meissner**, presented at the Barings Real Estate Engineering Conference, Marco Island, FL, April 2018

“An Overview of Building Owners Services & How Metallurgical Examinations are Performed,” **Lloyd C. Meissner**, presented at the NAREIM Conference (National Association of Real Estate Investment Managers), La Jolla, CA, October 2016

“Failure Analysis Case Studies,” **Lloyd C. Meissner**, presented at GRACO – Lubrication Equipment Division (LED), Anoka, MN, May 2013

Selected Project Experience

Butane Cannister Failure Analysis

A small butane cannister failed while being used in a portable stove at a catering event. This resulted in a flash fire causing personal injuries. Exemplar testing was used to evaluate the overpressure devices required by industry standards in the stove and cannister. Materials testing was performed to determine the components of the stove, their respective melting temperatures, and any effects a flash fire may have caused.

The investigation showed the cannister had been overheated and the release mechanism system on the stove failed to eject the butane cannister properly. This allowed overpressure to occur in the cannister and subsequent cannister failure. When the cannister failed, the released butane was ignited, causing the flash fire.

Firearms Plating Failure Analysis with Xray CT Scanning

A firearms manufacturer found tiny visual defects (< 0.003” dia.) on random lots of die castings. The die casting is designed to have a mirror finish and is cast, deburred, cleaned, polished to a high luster, and then copper and nickel plated for corrosion protection. The die casting shop blamed the plating shop and vice versa.

Metallography and X-Ray CT scanning was performed, confirming the defects were not originating from inherent die casting porosity and shrinkage but were in the plated copper base layer and mirrored in the nickel over plating layer. SEM/EDS identified aluminum oxide particles trapped in the copper base layer, due to trapped contaminants. These were subsequently filtered from the bath providing defect free copper plating.

Medical Device Contamination Analysis

Identification of foreign materials (FOD) is a frequent request from medical device manufacturers. Recently, contamination was observed after a catheter testing program. A variety of analytical techniques were utilized including filtration, optical microscopy, SEM/EDS, and FT-IR analyses to identify the FOD observed. In this unique case, thin flakes of transparent material were observed that were denser than water and surprisingly reacted to a permanent magnet. Subsequent analysis of the FOD revealed fluoropolymer flakes with fine embedded stainless steel particles. Wear in the device seal was the origin of the FOD.

Water Pipe Evaluations for Building Owners and Buyers

Building owners and real estate investors often require detailed inspection and testing of water pipes in building systems. A recent evaluation was performed for a hotel investor prior to a purchase. This evaluation of domestic hot and cold water copper pipe yielded information regarding the useful life. In this case, although the property was > 25 years old, negligible effects from corrosion, erosion or pitting were observed.